Global Precipitation (Means and Variations): GPM, TRMM and GPCP

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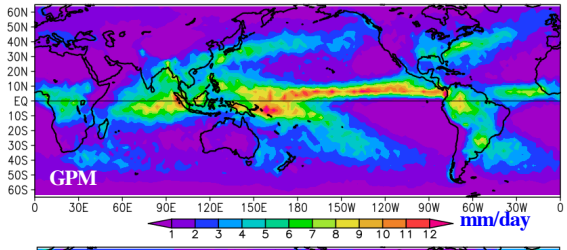
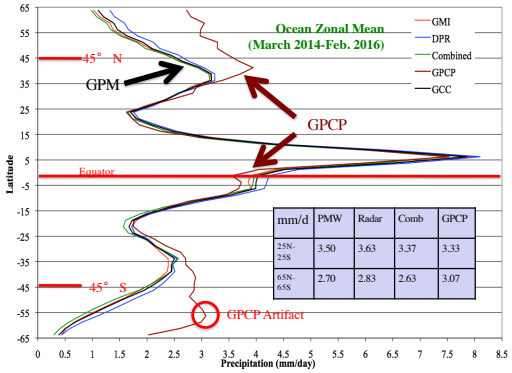
Objectives

- *Utilize data from GPM multiple instruments and algorithms to develop Global Composite Climatology (GCC) for comparison with and improvement of GPCP.*
- *Analyze large-scale inter-annual variations of rainfall with both PMW and radar observations in relation to surface temperature and understand differences between radar and PMW results.*

Two-year (2014.03-2016.02) Composite Climatology

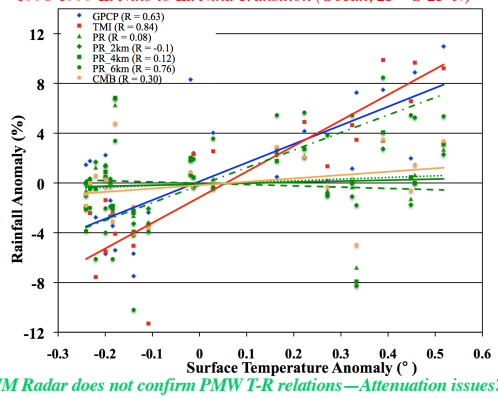




GPM somewhat higher than GPCP in tropics, but lower in extra-tropics

TRMM-based Sfc. Temp.-Rainfall Relations (Active vs. Passive Microwave)

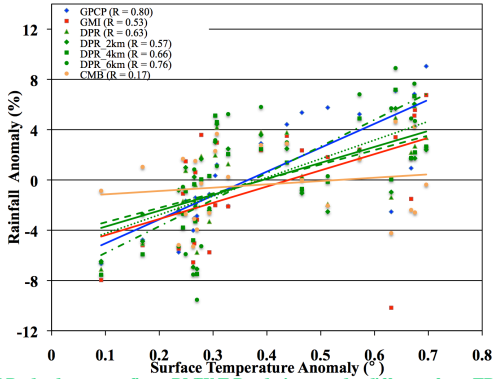
1998-1999 El Nino to La Nina Transition (Ocean, 25° S-25°N)



TRMM Radar does not confirm PMW T-R relations—Attenuation issues?

GPM-based Sfc. Temp.-Rainfall Relations (Active vs. Passive Microwave)

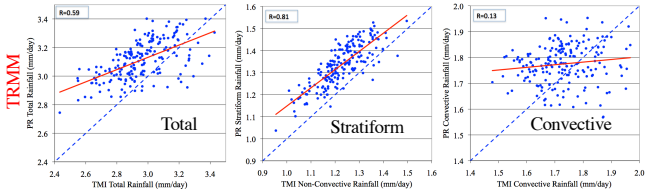
2014-2016 Neutral to El Nino Transition (Ocean, 25° S-25°N)



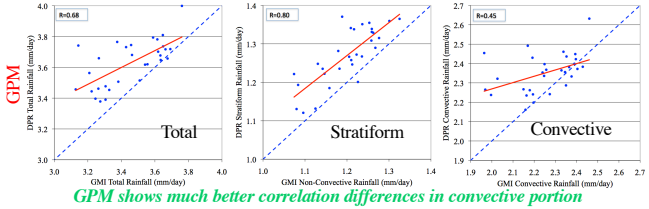
GPM Radar better confirms PMW T-R relations—why different from TRMM?

TRMM Radar ~0%/C GPM Radar ~13%/C PMW ~10%/C

Inter-annual Variation of Ocean (25° S-25°N) Tropical Rain (Active vs. Passive Microwave)

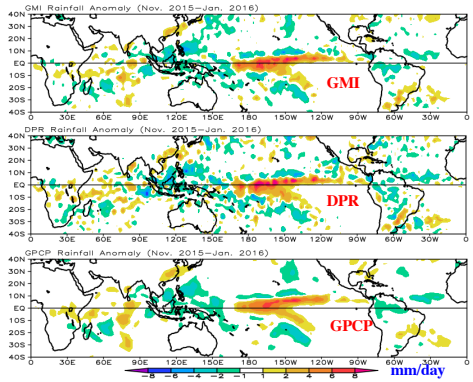


TRMM correlation differences in total ocean rain due solely to convective portion (right panel)—Attenuation issues?



GPM shows much better correlation differences in convective portion

Precipitation Anomalies (2015-2016 El Nino)



Summary

- **Over tropical oceans GPM-based mean estimates slightly higher (~ 5-8%) than TRMM (and GPCP).**
- **Over high latitude oceans GPM-based mean estimates are low compared to GPCP and CloudSat-based estimates.**
- **GPM radar results for 2014-2016 (including El Nino) better agree with surface temperature – rainfall relations for PMW results (including GPCP) than did TRMM radar results. Reasons for this seem to be related to intense convective rainfall near surface better defined with DPR.**

Mean Precipitation (mm/day) of Ocean (25°S-25°N) during Mar.-Aug. 2014 (TRMM/GPM Overlap)